NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF ECONOMICS AND STATISTICAL ENGINEERING

STATISTICAL ENGINEERING PROGRAM

EC418 – LINEAR ALGEBRA II

I. GENERAL INFORMATION

CODE	: EC418 Linear algebra II
SEMESTER	: 4
CREDITS	: 3
HOURS PER WEEK	: 5 (Theory 2, Practice 3)
PREREQUISITES	: EC315 Linear algebra I
CONDITION	: Mandatory

II. COURSE DESCRIPTION

The goal of the course is to consolidate and develop the concepts of linear algebra, which allow a successful development in subsequent courses, as well as in their professional performance. Develop student's ability to abstract and solve problems from the perspective of algebra.

III. COURSE OUTCOMES

- To develop the concepts of linear algebra, especially the diagonalization of matrices and their applications.
- Use and management of quadratic forms and their interpretation.
- Enable students to apply algebra tools in practical engineering situations.

IV. LEARNING UNITS

1. Review of vector spaces: Vector spaces and subspaces. Linear independence, bases and dimension. Change of bases.
2. Linear transformations. Concept, nucleus and image. Nullity and rank. Properties, fundamental theorem of linear transformations.
3. Matrix representation of a transformation, base change matrix.
4. Properties. Operations with linear transformations.
5. Vector space of linear transformations. Classification of linear transformations: monomorphisms, epimorphisms, isomorphisms, endomorphisms and automorphisms. Linear inverse transformations, properties.
6. Eigenvalues and eigenvectors. Definition and properties of eigenvalues and eigenvectors.
7. Characteristic polynomial of a matrix.
8. Diagonalization and triangulation of matrices. Diagonalization of symmetric matrices.
9. Applications: fibonacci sequence, solution of a system of differential equations with constant coefficients, Markov chains, population growth.

10. Internal product. Internal product in R^n. Euclidean vector space, properties. Orthogonal and orthonormal sets
11. Orthonormal bases. Ortho-normalization process of Gram Schmidt. Applications.
12. Orthogonal projection. Orthogonal space. QR decomposition. Least Squares.
13. Bilinear forms. Bilinear forms in finite dimension. Properties and applications.
14. Quadratic forms. Quadratic forms in finite dimension. Properties and applications.
15. Range of a quadratic form. Defined and semi-defined quadratic forms. Maximum and minimum of a quadratic form.

V. METHODOLOGY

- Exhibition of topics in the classroom, using slate and down.
- Additional exposure using some software for linear algebra.
- Delivery of readings and exercise lists.

VI. EVALUATING SYSTEM

Evaluating System "G". Calculating the final average: **PF = (EP + EF + PP) /3**
Four graded practices are applied, the lowest grade is deleted.
EP: Mid-term Exam, EF: Final Exam, PP: Average of qualified practices.

VII. BIBLIOGRAPHY.

1. **Anton, Howard.** Introduction to Linear Algebra. Editorial Limusa. 2009.
2. **Grossman, Stanley.** Linear Algebra with Applications. McGraw Hill Interamericana. 1992.
3. **Kolman, Bernard & Hill, David.** Linear algebra. Pearson Education. 2006.
4. **Lang, Serge.** Linear Algebra, Inter-American Educational Fund. 1975.
5. **Lay, David.** Linear algebra and its applications. Pearson Education. 2012.
6. **Noble, Ben & Daniel, James.** Linear Algebra Applied. Prentice Hall Hispan-american. 1989.
7. **Poole, David.** Linear Algebra: A Modern Introduction. Cengage Learning.